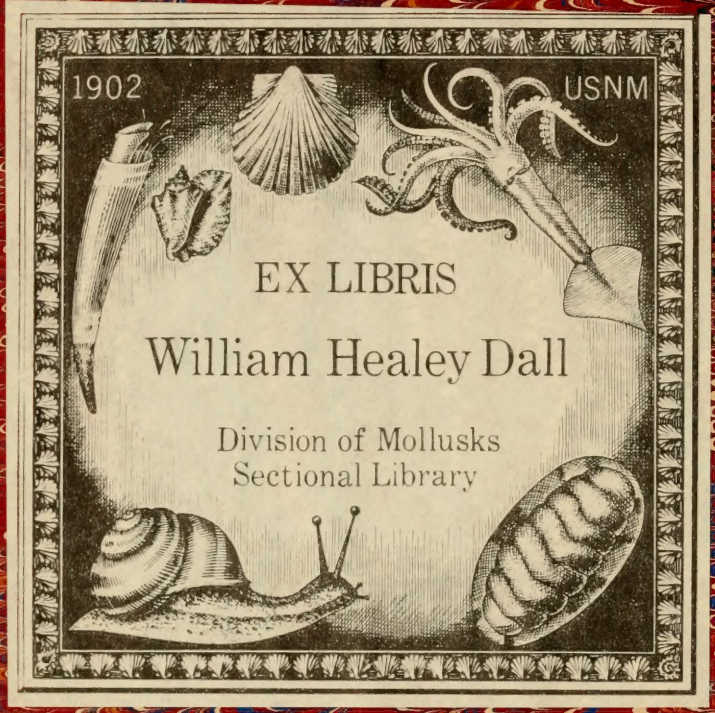
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17. *On the Systematic Position of the Brachiopoda;* by E. S. Morse. (From the Proceedings of the Boston Society of Natural History, vol. xv, 1873.) 60 pages, with numerous figures.—In this memoir Professor Morse has presented, at some length, his arguments in favor of uniting the Brachiopods with the Chætopod Worms. His avowed object is "to show that in every point of their structure, the Brachiopoda are true worms, with possibly some affinities to the Crustacea, and that they have no relations to the Mollusca, save what many other worms may possess in common with them."

In this and several other valuable papers on the Brachiopods the author has presented many facts of great interest and importance concerning their anatomy and embryology, and for these he deserves much credit, whether we accept his theories concerning their relations to the worms, or not. A full discussion of his theory and arguments, on this subject, will not be attempted at this time; but as some of his statements are calculated to mislead those not familiar with the subject, a few exceptions to such statements may not be out of place. On pages 7 to 10 (319 to 322, in Proc.) a summary is given of the characters in which Worms and Mollusks are supposed to differ; and on pages 58 and 59, the characters of "Vermes" and Brachiopods are compared in parallel columns. In both places the terms "worms," "Vermes," "Annulata," are used so indefinitely that it is not always easy to tell whether certain characters are intended to apply to all worms, or "vermes," or to particular groups, like the Annelids. But considering the immense diversity in the anatomy and embryology of the numerous groups, of at least ordinal value, if not classes, already referred to the "Vermes," this distinction is of essential importance. Thus it would be easy to show that there are exceptions (often very numerous) to nearly every character given as characteristic of "Vermes" on pp. 58, 59. It would also be easy to show that part of the characters given as common to Vermes and Brachiopods are common, likewise, to most other classes of Invertebrata, including certainly some Mollusks and Radiates.

The first character given (p. 7) relates to form: "We have in the Vermes a form, whose length is much greater in proportion to its breadth than in the Mollusks." Many Annelids, like *Aphrodite*, *Euphrosyne*, certain leeches, and many of the lower "Vermes," like the Planarians, are notable exceptions, being relatively broader and shorter than the majority of Mollusks. Again, "the worm is perfectly bilaterally symmetrical, depressed, flattened or circular, the dorsal and ventral regions so near alike in many cases as to be distinguished with difficulty, and the body never flattened laterally," the reverse being stated of the Mollusks. But we find many Annelids that are more or less asymmetrical,

either in the number and form of the jaws (*Diopatra*, etc.), or in the cephalic appendages, as in *Serpulidæ*, where one of the branchiæ, on one side, is often transformed into an operculum; or in various other organs, in different groups; while the dorsal and ventral regions are often quite as strongly contrasted as in any mollusk; and in some cases the body is compressed laterally (*Ammotrypane*). But on the other hand, mollusks are often nearly or quite symmetrical (many Nudibranches, Chitons, Pteropods, Cephalopods) and are frequently cylindrical or even depressed (*Doris*, Chitons, Cephalopods, Pteropods). In fact *form* is a very poor character for characterizing any large group of animals, and should have little or no weight in this case. The ventral connections of the "locomotor muscles" in mollusks and their lateral and dorsal attachment to the integument in worms are given as distinctive. But we generally find the locomotor muscles of animals connected with the locomotive organs, wherever these may be situated. So in *Pecten* we find that the main locomotor muscles are attached laterally to the shell, that being its principal organ of locomotion; and in Cephalopods we find them on the sides and back, as well as ventrally, so that the mantle may be used as a locomotive organ. On the other hand, many worms, like *Aphrodite*, *Lepidonotus*, many leeches, Trematodes, and other worms, both high and low, have their locomotive organs as truly ventral as those of Gastropods. "In the Mollusk the tegumentary envelope is prolonged, and oftentimes continuous, forming a sac or mantle, inclosing a conspicuous cavity, and protecting the gills." This is, indeed, a valuable character, but not accurately stated, for the mantle does not always form a "cavity," and is often nearly or quite abortive, and the gills are often situated on the back or sides, as in the Nudibranchs. But in this character the Brachiopods agree with the Mollusks, and not with the worms. "In the worm the digestive canal is straight, rarely convoluted, and suspended freely in the perivisceral cavity." "In the Mollusk, the intestine is always convoluted, not suspended freely in the perivisceral cavity, but intimately blended, or united with other organs." The intestine varies immensely in both groups, according to the food of the species, and cannot be properly used as a character for separating two sub-kingdoms. Among Sipunculoid Worms (as stated on p. 26) the intestine is generally very long and greatly convoluted, and may terminate either anteriorly or posteriorly.

In most Nemerteans, Planarians, and Trematode worms the intestine is not "freely suspended," but firmly united to the other organs and the tegumentary system. "In Vermes there is a peculiar depuratory apparatus characteristic of all. In the Annulata this apparatus takes the shape of bilaterally symmetrical tubes, in pairs, opening externally and communicating with the perivisceral caviity, by distinct independent infundibuliform orifices. In the Mollusca, with the exception of certain Cephalopoda, nothing of the kind is found, and where such communi-

cation does exist between the organs and the surrounding medium, it is by means of simple orifices in the walls of the cavity." The "depuratory apparatus" of "Vermes" is so diverse in structure and position in the different groups, as to render it very questionable whether these organs are homologous in the different orders. Moreover, there is still so much to learn concerning both the proper vascular circulation and the "depuratory apparatus" of ordinary Mollusca, and the connection of both with the exterior, that it is very unsafe to base generalizations on negative evidence of this kind. Even now, the utmost diversity of opinion exists, among the leading European anatomists, concerning the character of these organs in the commonest Mollusks, some asserting and others denying the existence of external vascular connections, lacunæ, capillaries, etc. It should also be considered that no "segmental organs" have yet been detected in the nearest allies of the Annelids, the Crustacea, although the two classes agree so closely in nearly all other respects that no one has been able, as yet, to frame strictly distinctive diagnoses for them. Nevertheless, the existence of the infundibuliform organs in Brachiopods is certainly one of their most remarkable characters; and also one of the strongest analogies with the Annelids which they possess.

The character of the nervous system of Brachiopods, according to the author's own statements, is quite as much like that of a degraded mollusk as like that of a degraded worm, and has no special resemblance whatever to that of any of the true Annelids, with which the author wishes to compare them. We may as well compare it with the nervous system of a Lamellibranch, without the pedal and posterior ganglia (for which there is no use), as with that of an Annelid destitute of the ventral series of ganglia. "In the Annulata, with the exception of the Discophora, the generative products are set free in the perivisceral cavity, receiving from the fluid therein contained certain nourishment." Another notable exception is found in the common earth-worms, and their allies, which have a distinct oviduct and male organ, in the median line beneath, and, like many leeches, lay eggs enclosed in capsules, not unlike those of many mollusks. Other exceptions also occur in the Annelids, while among the Cestodes, Trematodes, Nematodes, and Turbellaria, the oviduct is usually single and connected directly with the ovary, as in most Mollusca. But in Polyps and many common Fishes, etc., the generative products are discharged into the perivisceral cavity, as in most Chætopod Annelids. This is obviously a character of small importance, hardly sufficient to characterize even the several *orders* of Annelids. In the Mollusca, "with the exception of the Octopoda, the oviduct is single." Many other exceptions occur, in the Chitons, Lamellibranchs, etc. "Among the Mollusks, even when devoid of a shell in the adult, the embryo early develops a shell composed of one or two pieces." This is not the case in many Cephalopods and Pteropods.

From this summary it will be seen that not one of the characters given to worms is, properly speaking, characteristic, or diagnostic, of the Vermes, as a whole, and few of them can be applied to more than a single order, while many of them are common to the worms and various other invertebrates, belonging to diverse classes and branches, including Mollusca. The same remarks apply to most of the additional characters given to Vermes, on pp. 58, 59. Some of the latter are even more useless, as distinctive of Vermes. Thus they are said to have "an extensive vascular system, containing a colored fluid representing the pseudo-hæmal system." This has not usually been given as a character for all Vermes," but merely for the higher Annelids; but it does not hold good even within those limits, for there are many Chætopod Annelids, belonging to several different families, that are totally destitute of pseudo-hæmal vessels, but have only one fluid, which fills the perivisceral cavity, (*Aphlebina*, *Polycirrus*, *Glycera*, etc.), and yet some of these genera belong to families in which other genera have a complete system of vessels, (see also Morse's quotation from Claperède, p. 25). The possession of "chitinous outgrowths, either as scales, plates, hairs, or spines" is a character that applies only to a part of the true Annelids, most leeches and many Sipunculoids, as well as most of the Helminths (except in the embyos of some) being destitute of such appendages. In fact most of these characters are no more characteristic of worms, as a group, than the presence of a shell is characteristic of Mollusca.

These facts are brought forward, not for the purpose of refuting Prof. Morse's views concerning the position of Brachiopoda, which, if established at all, must rest on other and better foundations, but to show how vague are his definitions of "Vermes," and how indefinite his ideas as to what a *worm* really is. The difficulty of defining the heterogeneous group of "Vermes" would be greatly increased by adding to it the Brachiopods and Polyzoa, as the author proposes. Nor can he better the matter, by separating the "Vermes" from the rest of the Articulata, and calling the group a "sub-kingdom," as some other writers have alreany done. In fact, there is far greater difference between the Annelids and lower worms (Helminths), than between the Annelids and Crustacea. These two last classes approximate so closely in structure, in some of their forms, that it has become a matter of extreme difficulty to find diagnostic characters for separating them, and few greater absurdities have been proposed in classification, in modern times, than to separate them in two "sub-kingdoms" or branches. On the same basis every class of animals might be made a "sub-kingdom."

Another feature of the arguments presented demands attention from those who may wish to form an impartial judgment of them. The author naturally takes great pains in every case to point out all the resemblances between the organs of worms and those of Brachiopods that he compares, but he does not always allude to the *differences*. Thus, on p. 11, he compares the elongated

caudal segments of Annelids, like *Pectinaria* and *Sabellaria*, with the peduncle of Brachiopods, but he does not mention the fact that in the former the anal orifice is at the end of the caudal segment, which is bent forward, and that this elongation is to facilitate the discharge of the fæces; while the peduncle of Brachiopods is imperforate, does not contain the intestine, and is essentially an organ of attachment. The fabrication of tubes by the agglutination of sand with a mucous secretion, in *Lingula*, is a character of trivial importance, for many soft bodied species of nearly all classes of invertebrates, whether Protozoa, Radiata, Mollusca, or Articulata, do the same thing. On p. 28, the identity of the cirri of Brachiopods and Annelids is asserted, but he has not mentioned that in the latter these organs are genuine gills, with a complicated capillary vascular circulation, which has not been shown to exist in the former. So of the pallial membranes of Brachiopods and the collar of Annelids, he has shown their points of resemblance, but has largely ignored their great differences in structure, relations, and function. We would also remind our readers that a liberal use of printers-ink on diagramatic cuts, like those on page 21, may serve to conceal differences, as well as to show resemblances.

The facts in regard to the embryology of the Brachiopods, which are brought out by Prof. Morse in this and in a subsequent memoir, are of great interest and importance, and do, indeed, show remarkable points of resemblance between the embryos and larvæ of Brachiopods and of certain worms. A. E. V.

18. *Occurrence of Gigantic Cuttle-fishes on the coast of Newfoundland;* by A. E. Verrill.—Considerable popular interest has been excited by several articles that have recently been published and extensively circulated in the newspapers of Canada and the United States, in regard to the appearance of gigantic "squids" on the Newfoundland coast. Having been so fortunate as to obtain, through the kindness of Prof. S. F. Baird, the jaws and other parts of two of these creatures, and, through the courtesy of Dr. J. W. Dawson, photographs of portions of two other specimens, I have thought it worth while to bring together, at this time, the main facts respecting the several specimens that have been seen or captured recently, so far as I have been able to collate them, reserving for a future article the full descriptions and figures of the jaws and other portions, now in my possession.

We now have reliable information concerning five different examples of these monsters that have appeared within a short period, at Newfoundland. (1). A specimen found floating at the surface, at the Grand Banks, in October, 1871, by Captain Campbell, of the schooner B. D. Haskins, of Gloucester, Mass. It was taken on board and part of it used for bait. Dr. A. S. Packard has given, in the American Naturalist, vol. vii, p. 91, Feb., 1873, all the facts that have been published in regard to this individual. But its jaws have since been sent to the Smithsonian Institution, and are now in my hands to be described and figured. They were thought

by Professor Steenstrup, who saw a photograph of them, to belong to his *Architeuthis monachus*, which inhabits the northern coasts of Europe, but is still very imperfectly known. The horny jaw or beak from this specimen is thick and strong, nearly black; it is acute at the apex, with a decided notch or angle on the inside, about ·75 of an inch from the point, and beyond the notch is a large prominent angular lobe. The body of the specimen from which this jaw was taken is stated to have measured 15 feet in length and 4 feet 8 inches in circumference. The arms were mutilated, but the portions remaining were estimated to be 9 or 10 feet long, and 22 inches in circumference, two being shorter than the rest. It was estimated to weigh 2000 pounds.

(2). A large individual attacked two men, who were in a small boat, in Conception Bay, and two of the arms which it threw across the boat were cut off with a hatchet, and brought ashore. Full accounts of this adventure, written by Mr. M. Harvey, have been published in many of the newspapers.* One of the severed arms, or a part of it, was preserved in the museum at St. John, and a photograph of it is now before me. This fragment represents the distal half of one of the long tentacular-arms, with its expanded terminal portion covered with suckers, 24 of which are larger, in two rows, with the border not serrate, but 1·25 inch in diameter; the others are smaller, very numerous, with the edge supported by a serrated calcareous ring. The part of the arm preserved measured 19 feet in length, and 3·5 inches in circumference, but wider, "like an oar," and 6 inches in circumference, near the end where the suckers are situated; but its length, when entire, was estimated at 42 feet.† The other arm was destroyed and no description was made, but it was said to have been 6 feet long and 10 inches in diameter; it was evidently one of the eight shorter sessile arms. The estimate given for the length of the "body" of this creature (60 feet) was probably intended for the *entire length*, including the arms.

(3). A specimen was found alive in shallow water, at Coomb's Cove, and captured. Concerning this one I have seen only newspaper accounts. It is stated that its body measured ten feet in length and was "nearly as large round as a hogshead" (10 to 12 feet); its two long arms (of which only one remained) were forty-two feet in length and "as large as a man's wrist;" its short arms were six feet in length, but about nine inches in diameter, "very stout and strong;" the suckers had a serrated edge. The color was reddish. The loss of one long arm and the correspondence of the other in size to the one amputated from No. 2, justifies a suspicion that this was actually the same individual that attacked the boat. But if not, it was probably one of the same species, and of about the same size.

* Also in the Annals and Magazine of Natural History, January, 1874, with a wood-cut of the arm.

† Doubtless these long arms are very contractile and changeable in length like those of the ordinary squids.

(4). A pair of jaws and two of the suckers were recently forwarded to me from the Smithsonian Institution. These were received from Rev. A. Munn, who writes that they were taken from a specimen that came ashore at Bonavista Bay; that it measured thirty-two feet in length (probably the entire length, including more or less of the arms); and about six feet in circumference. This jaw is large and broad, but much thinner than that of No. 1, and without the deep notch and angular lobe seen in that specimen. It probably belongs to the *Architeuthis dux* of Steenstrup, or at least to the same species as the jaw figured by Dr. Packard.

(5). A smaller specimen, captured in December, in Logic Bay, about three miles from St. John, in herring nets. Of this I have a description in a letter to Dr. Dawson, from M. Harvey, Esq., who has also published a brief account of it in the "Morning Chronicle," of St. John. The letter is acompanied by two photographs of the specimen: one showing the entire body, somewhat mutilated anteriorly; the other showing the head with the ten arms attached. The body of this specimen was over seven feet long, and between five and six feet in circumference; the caudal fin was twenty-two inches broad, but short, thick, and emarginate posteriorly on each side, the end of the body being acute; the two long tentacular-arms were twenty-four feet in length, and two and a half inches in circumference, except at the broader part near the end; the tips slender and acute; the largest suckers 1·25 inch in diameter, with serrated edges; the eight short arms were each six feet long; the two largest were ten inches in circumference at base; the others were 9, 8 and 7 inches. These short arms taper to slender acute tips, and each bears about 100 large, bell-shaped suckers, with serrated margins. Each of the long arms bear, about 160 suckers on the broad terminal portion, all of which are denticulated; the largest ones, which form two regular alternating rows, of twelve each, are about an inch in diameter. There is also an outer row of much smaller suckers, alternating with the large ones, on each margin; the terminal part of these arms is thickly covered with small suckers: and numerous similar small suckers are crowded on that portion of the arms where the enlargement begins, before the commencement of the rows of large suckers. The arrangement of the suckers is nearly the same as on the long arm of No. 2, but in the latter the terminal portion of the arm, beyond the large suckers, as shown in the photographs, is not so long, tapering, and acute, but this may be due to the different conditions of the two specimens. It is probable that this was a young specimen of the same species as No. 2.

From the facts known at present, it appears probable that all these specimens, and several others that have been reported at various times from the same region, are referable to two species; one (probably *Architeuthis monachus*) represented only by the first of those enumerated above, and having a more elongated form of body and stouter jaws; the second (probably *A. dux*) represented by Nos. 2 to 5, above described, having a short,

thick, massive body, and broad, but comparatively thin jaws, which are also different in form. Some of the differences in size and proportions, and in the suckers, observed among the four specimens referred to the latter species, may be due to sex, for the sexes differ considerably in these characters in all known cuttle-fishes.

19. *Revision of the Echini;* by ALEXANDER AGASSIZ. Part iii, 4to, with 45 plates. Illustrated Catalogue of the Museum of Comparative Zoölogy. Cambridge, Mass. 1873.—This excellent work is profusely illustrated by unique plates, a large part of which have been made by different photographic printing processes, directly from photographs of the specimens, and are of unrivalled excellence. The Woodbury-type process, the Albert-type and the Heliotype, have all been successfully employed, while superior lithographs have also been used to some extent. Part iii. contains detailed descriptions of all the known species, except those of the east coast of North America, which were described in Part ii. Such species are, however, referred to, in their proper systematic places. Twenty-eight plates illustrate Part iii; the remaining seventeen relate to structure and belong to Part iv, but are issued in advance of the text, owing to the loss of the MSS., drawings, and some of the plates, by the great Boston fire, in November, 1872. A. E. V.

20. *The Marine Mammals of the Northwestern Coast of North America, described and illustrated, together with an account of the American Whale-fishery;* by CHARLES M. SCAMMON, Captain U. S. Revenue Marine. San Francisco: John H Carmany & Co. 4to.—The advance copies of the plates of this work, that we have seen, are highly satisfactory, and considering the well known ability and enthusiasm of the author, we anticipate that the book, when completed, will be a valuable contribution to science, in a department which is still very imperfectly understood, and of great importance economically. The work deserves, and should receive, the support of all who are interested in promoting the study of Natural History. It is to be illustrated by thirty or more lithographic plates, and is offered to subscribers at the very low cost of ten dollars. A. E. V.